Terminal

- The existing passenger terminal is undersized to accommodate existing levels of passengers.
- Certain passenger processing elements of the passenger terminal are severely undersized, including security screening, the departure lounge and restrooms.
- New terminal facilities will be required short term to meet immediate needs. In the long-term a new passenger terminal will be required.

Access and Parking

- Existing access to the airport is adequate to meet existing and future levels of demand.
- Existing parking is adequate to meet demand, but future demand will exceed capacity. Additional parking facilities will be required.
- Additional parking for rental car storage will be required.

General Aviation Facilities

- Proposed hangar construction will meet all short –term demand. Long-term additional hangar space may be needed depending upon market factors.
- Existing aircraft ramp for based and transient aircraft will be sufficient to meet demand with the exception of certain special events. The construction of additional ramp to meet the needs of the special events is not deemed to be cost effective and is not recommended at this time.

SECTION 4
ALTERNATIVES ANALYSIS

4.1 INTRODUCTION

This section examines alternative methods of providing the facilities that were identified in the preceding section as being needed to serve projected levels of demand during the study period. The alternative analysis focuses on three primary functional areas of the airport:

- Airfield Facilities
- Terminal Area Facilities
- Aircraft Parking Ramp

In addition to these areas, the analysis briefly addresses general aviation facilities. For each of the functional areas, alternatives were developed and are described in both text and graphical form on the following pages. Advantages and disadvantages associated with each alternative are identified and quantified to the extent possible. Conceptual construction cost estimates are also included for comparison purposes.

4.2 AIRFIELD ALTERNATIVES

Airfield alternatives were developed to address two primary objectives. The first objective is to provide a runway safety area that meets FAA airport design standards. The second objective is to assess ways of increasing the existing runway length of 4,801 feet to a length of 5,800 feet in accordance with the runway length requirements identified in Section 3.

The existing runway safety area does not meet FAA design standards. These standards specify that the runway safety area for runways serving aircraft in Design Group C-III extends 1,000 feet beyond the end of pavement and has a width of 500 feet. As previously shown in Figure 3.2, the amount of land surrounding Runway 9/27 that meets the RSA clearance and grading requirements is significantly smaller than the FAA standard.

At the west end of the runway, see Figure 4.1, the runway safety area extends approximately 110 feet beyond the edge of pavement. The land beyond that point consists of mangroves followed by ponds. On the east end of the runway, see Figure 4.2, the amount of runway safety area provided is approximately 210 feet, although an irregular shaped area extends for approximately 400 feet before entering mangroves and ponds. In addition to the constraints at each end of the runway, mangroves and salt ponds also encroach upon a portion of the runway safety area north of the runway as depicted in Figure 4.3. Alternatives presented in this section address the requirements of establishing a runway safety area that meets FAA design standards.

With respect to the issue of runway length, a length of 5,800 feet was identified as the requirement to accommodate aircraft projected to regularly operate at EYW. This runway length would enable regional jets serving EYW to operate without limitations on the number of passengers that the

aircraft could accommodate. Airfield alternatives presented in the following paragraphs examine a variety of methods of extending the existing runway. Because the existing site is so constrained, a large number of alternatives were examined including many that would provide less than the required 5,800 feet. Furthermore, many of the airfield alternatives use a concept referred to as "Declared Distances". Declared distances is a process whereby an airport owner declares a certain portion of the runway as being available for takeoff or landing in order to meet runway safety area, runway object free area or runway protection zone requirements in a constrained environment. Consequently, this usually results in a portion of the runway pavement not being used for takeoff or landing calculations and can adversely affect aircraft and airline operations.

Because the concept of declared distances involves a number of terms and concepts that can be difficult to understand, the alternatives that follow have been presented in terms of showing the portion of runway that would be available for landing and takeoff. This greatly simplifies the terminology while still presenting the key variables to the reader.

4.2.1 AIRFIELD ALTERNATIVE 1 – NO-ACTION

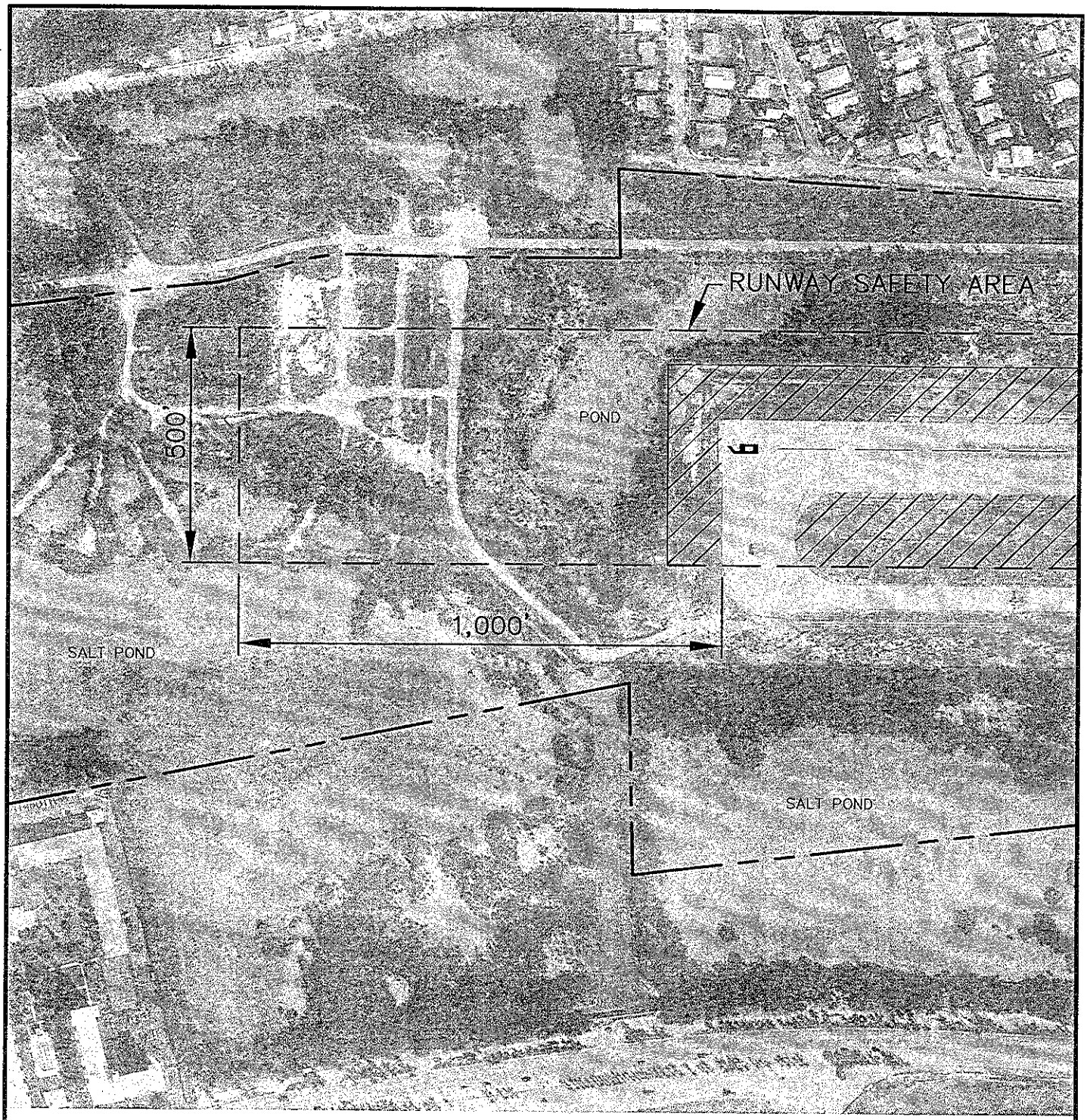
With this alternative, no improvements would be made to bring the existing runway safety area into conformance with FAA design standards and no extensions would be made to the runway. This alternative is depicted in Figure 4.4.

FAA guidance for runway safety areas is contained in FAA Order 5200.B entitled Runway Safety Area Program and dated October 1, 1999. The guidance contained in the order specifies that all runway safety areas at Part 139 certified airports, such as EYW, shall conform to the appropriate FAA standards to the extent practicable. Alternative 1 would not conform to this guidance because it does not show any attempt to investigate the planning, engineering and environmental factors associated with improving the RSA to the extent practicable.

4.2.2 AIRFIELD ALTERNATIVE 2 – ESTABLISH RUNWAY SAFETY AREA

With this alternative a standard runway safety area, having a width of 500 feet and a length that extends 1,000 feet beyond each end of the runway would be constructed as depicted in Figure 4.5. Implementation of this alternative would bring the runway safety area into conformance with FAA standards. This alternative would require the acquisition of approximately one-third of an acre of land along the northeast boundary of the airport, because the width of the runway safety area extends beyond the current property boundary.

Implementation of this alternative would have impacts to wetlands, mangroves, and ponds. Impacts to these habitats on the basis of land use cover were quantified and are shown in Appendix D. Overall, it is estimated that Alternative 2 would impact 31 acres of wetlands. It should be noted that this estimate is based upon aerial photo interpretation and does not represent field verification and delineation of wetlands.



LEGEND

AIRPORT PROPERTY LINE

LIMITS OF RUNWAY SAFETY AREA (RSA)

AREA THAT MEETS RSA REQUIREMENTS

N

300 0 300

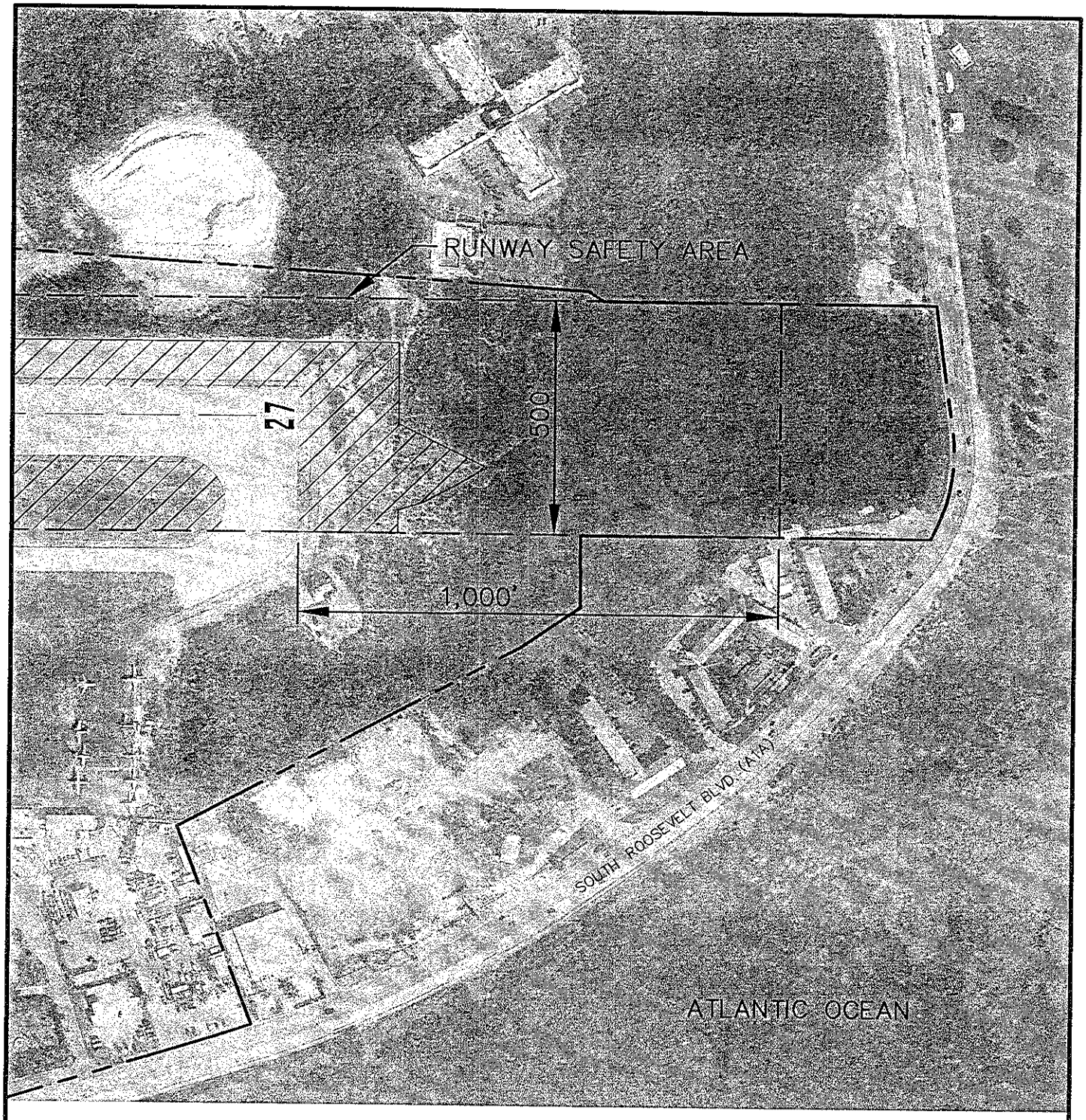
GRAPHIC SCALE IN FEET

Key West International Airport
Master Plan Update

RUNWAY 9 SAFETY AREA REQUIREMENTS

FIGURE: 4.1

J:\KEY WEST\MASTER PLAN UPDATE\EXHIBITS\FIG 4.1R.DWG 03/04/03 10:01



LEGEND

AIRPORT PROPERTY LINE

LIMITS OF RUNWAY SAFETY AREA (RSA)

AREA THAT MEETS RSA REQUIREMENTS

N

300 0 300

GRAPHIC SCALE IN FEET

Key West International Airport
Master Plan Update

RUNWAY 27 SAFETY AREA REQUIREMENTS

FIGURE: 4.2

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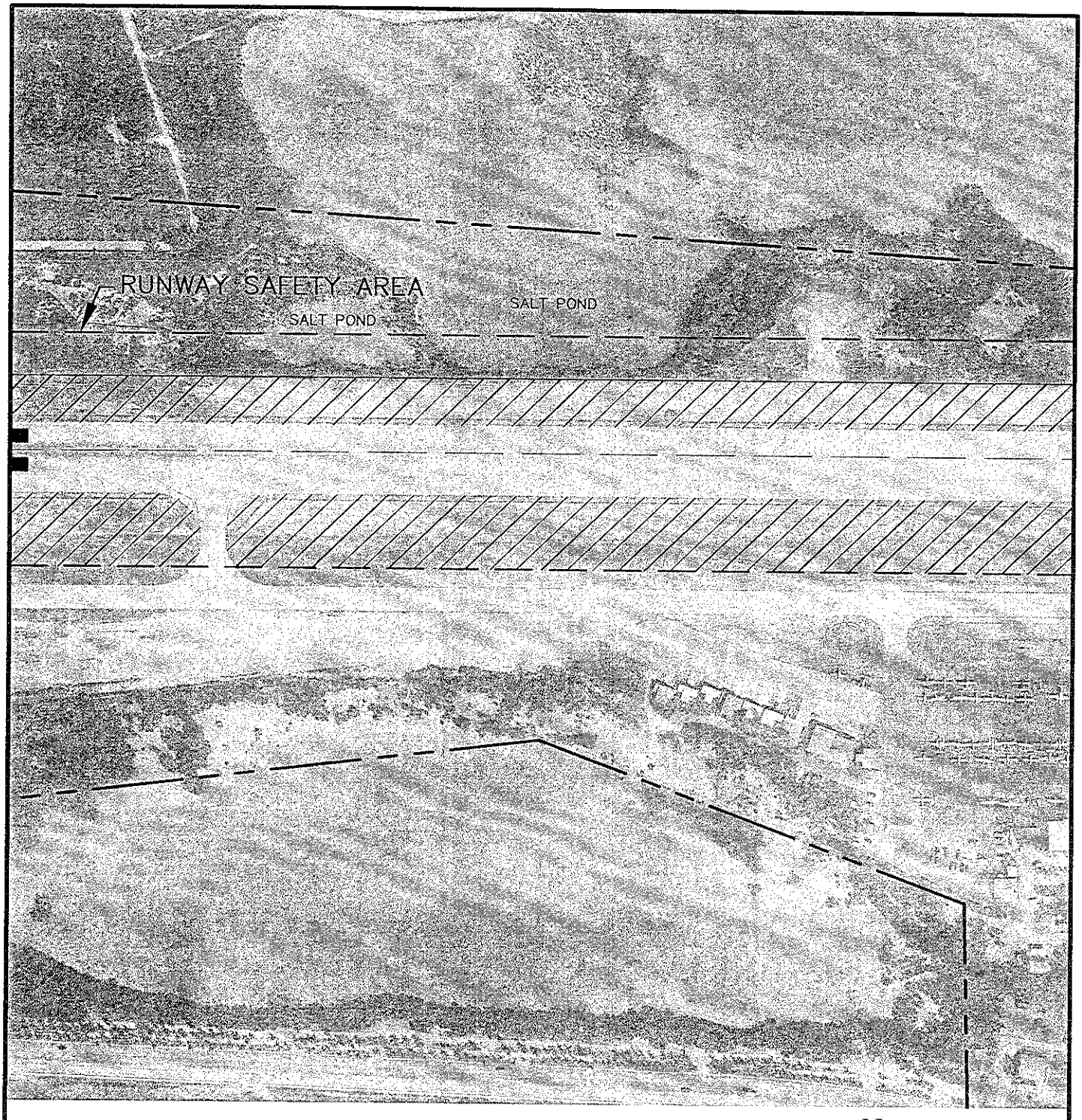


LEGEND

AIRPORT PROPERTY LINE

LIMITS OF RUNWAY SAFETY AREA (RSA)

AREA THAT MEETS RSA REQUIREMENTS

N

300 0 300

GRAPHIC SCALE IN FEET

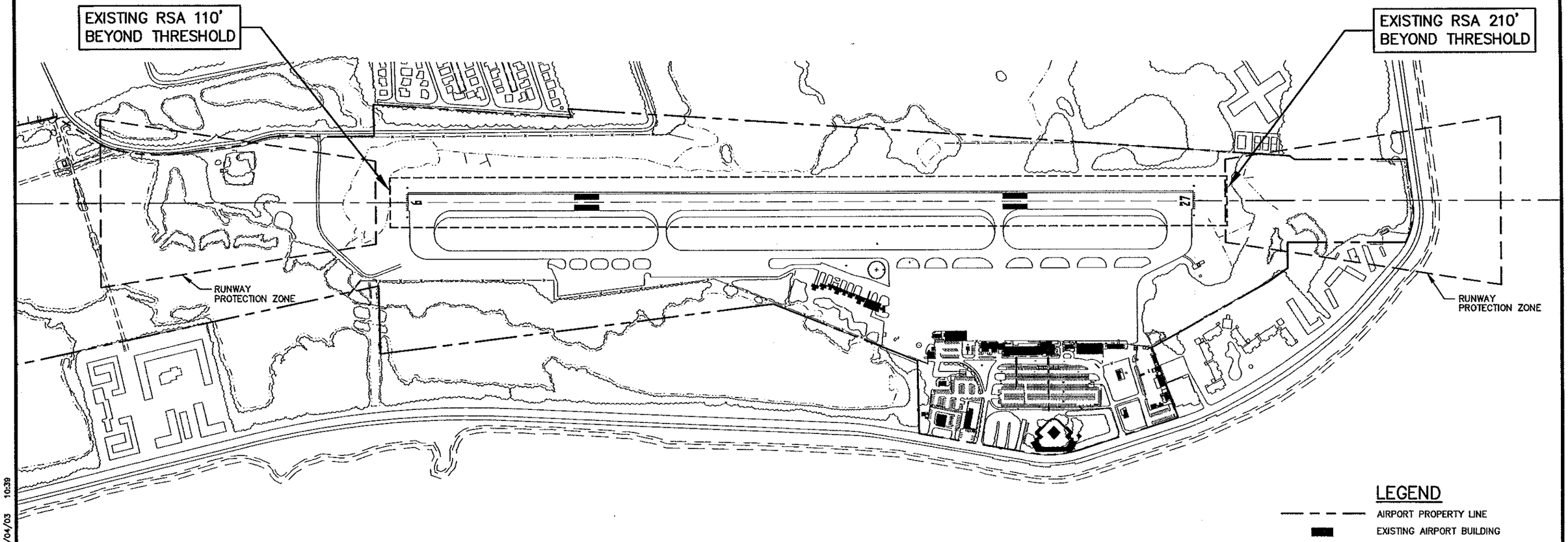
Key West International Airport
Master Plan Update

RUNWAY 9-27 SAFETY AREA REQUIREMENTS

FIGURE: 4.3

J:\KEY WEST\MASTER PLAN UPDATE\EXHIBITS\FIG 4.3R.DWG 03/04/03 10:24

EXISTING RUNWAY LENGTH = 4,801'
NO DECLARED DISTANCES



LEGEND

AIRPORT PROPERTY LINE

EXISTING AIRPORT BUILDING

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

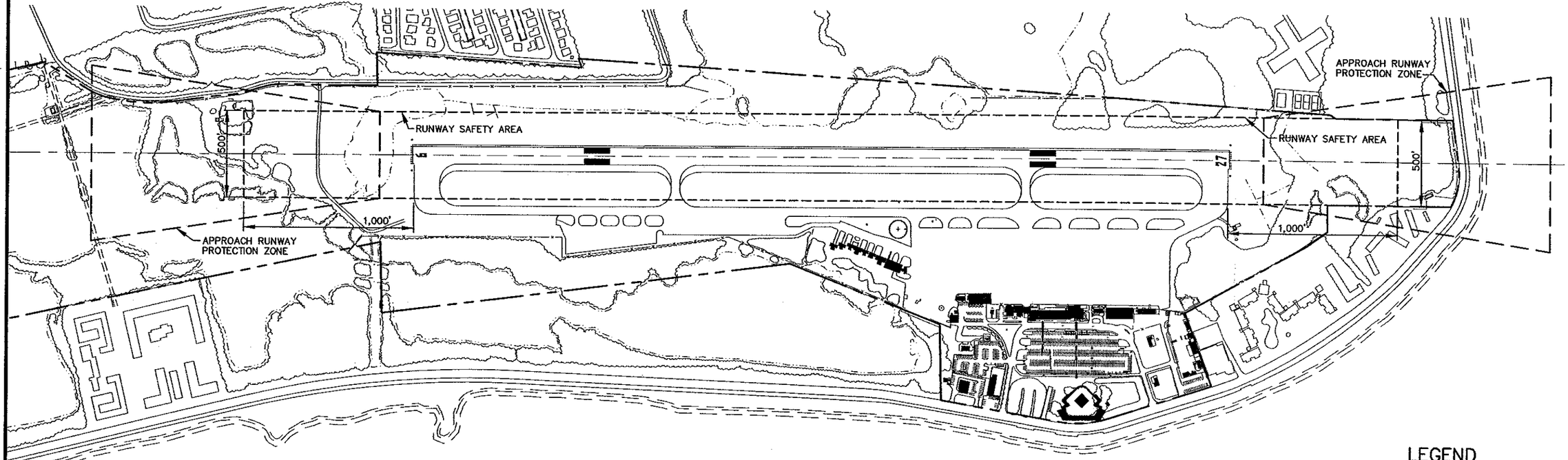
AIRFIELD ALTERNATIVE 1
NO-ACTION

Key West International Airport
Master Plan Update

FIGURE 4.4

J:\KEY WEST\MASTER PLAN UPDATE\EXHIBITS\FIG 4.4R.DWG 03/04/03 10:39

EXISTING RUNWAY LENGTH = 4,801'
NO DECLARED DISTANCES



LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRPORT BUILDINGS
- RUNWAY SAFETY AREA
- APPROACH RUNWAY PROTECTION ZONE

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

AIRFIELD ALTERNATIVE 2
ESTABLISH
RUNWAY SAFETY AREAS

Key West International Airport
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FIGURE 4.5

J:\KEY WEST\MASTER PLAN UPDATE\EXHIBITS\FIG 4.5R.DWG 03/04/03 10:52

On the west end of the airport, this alternative would impact the East Martello Battery Bunker. This bunker, which is in extremely poor condition, is a World War II era facility that protrudes approximately 20 feet from the surrounding ground. Because this facility is eligible for listing on the National Register of Historic Places, additional study of the facility would be required to evaluate options for constructing a standard safety area in this location.

The estimated construction cost for a runway safety area that meets FAA standards is $7.7 million exclusive of land acquisition and environmental mitigation costs.

4.2.3 AIRFIELD ALTERNATIVES 3 THROUGH 5A

Five airfield alternatives examined a series of extensions to the east and west end of the existing runway. These alternatives attempted to provide runway extensions that would primarily remain within the area created by the establishment of a standard runway safety area as well as within the existing airport property boundary. The extensions also attempted to minimize impacts to the salt ponds by modifying the proposed parallel taxiway to serve the proposed runway extensions.

Alternatives 3 through 5A are depicted in Figures 4.6 through 4.10. Several conclusions can be drawn from these alternatives and are listed below:

- Proposed runway extensions would increase the takeoff distance only for departures in the other direction. In other words, an extension on the west end of the runway, such as proposed by Alternative 3, would only increase takeoff distance available for departures to the east. This is because the proposed runway extension could not be considered as useable runway for departures to the west. Takeoff calculations must provide for a full safety area beyond the end of useable runway when using the declared distances concept. Thus, although the runway extension would provide additional pavement, the additional pavement could not be considered in takeoff calculations because it is assumed to be safety area.

- Proposed runway extensions would not change the location where aircraft land on the runway for any alternatives considered. This is because the location of the landing thresholds (i.e., a marked location on the runway where an aircraft can land on the runway) would not change in any alternative. Thus, landing aircraft would not be lower when passing over surrounding land uses than they are with the existing runway.

- Extensions on both ends would be needed to provide a reasonable balance between takeoff lengths available in each direction. This is because airlines need to have a reasonable expectation of the carrying capability of aircraft operations at the airport. For example, if one runway end were significantly shorter than the other, the airline would have to plan its operation for the shorter of the two runways. Otherwise the airline could be is a situation where they would have to

deny boarding to passengers if the shorter runway end was being used on a particular day.

- Noise contours were generated for each of the alternatives on the basis of aircraft operations in 2000. The figures for each alternative presents the noise contour for the existing runway and the noise contour that would result with implementation of the proposed runway extensions. In general, most of the noise contours are only affected by proposed extensions to the west end of the runway. This is because approximately 95 percent of all operations takeoff and land to the east. Consequently, proposed extensions on the east end of the runway do not have much of affect on the noise contour.

None of these alternatives provide the recommended runway length of 5,800 feet. However, they do answer a series of "what if" questions regarding the capabilities that could be provided by constructing shorter extensions on each end of the existing runway. The quantities of wetlands impacted by each alternative, as well as each alternative's conceptual construction cost, is presented in Table 4.1.

TABLE 4.1
COMPARISON OF AIRFIELD ALTERNATIVES
Key West International Airport
Master Plan Update

Alternative	Wetlands Affected (acres)	Construction Cost Estimate (dollars)
1	0	$0.0
2	31	$7.7
3	33.2	$9.1
3A	33.8	$9.3
4	32.5	$9.1
5	34.7	$10.0
5A	35.3	$10.1
5B	37.8	$10.4
6	36.2	$10.8

Source: URS, 2002.

4.2.4 AIRFIELD ALTERNATIVE 5B – RUNWAY EXTENSIONS AND SHIFT OF EAST RUNWAY SAFETY AREA

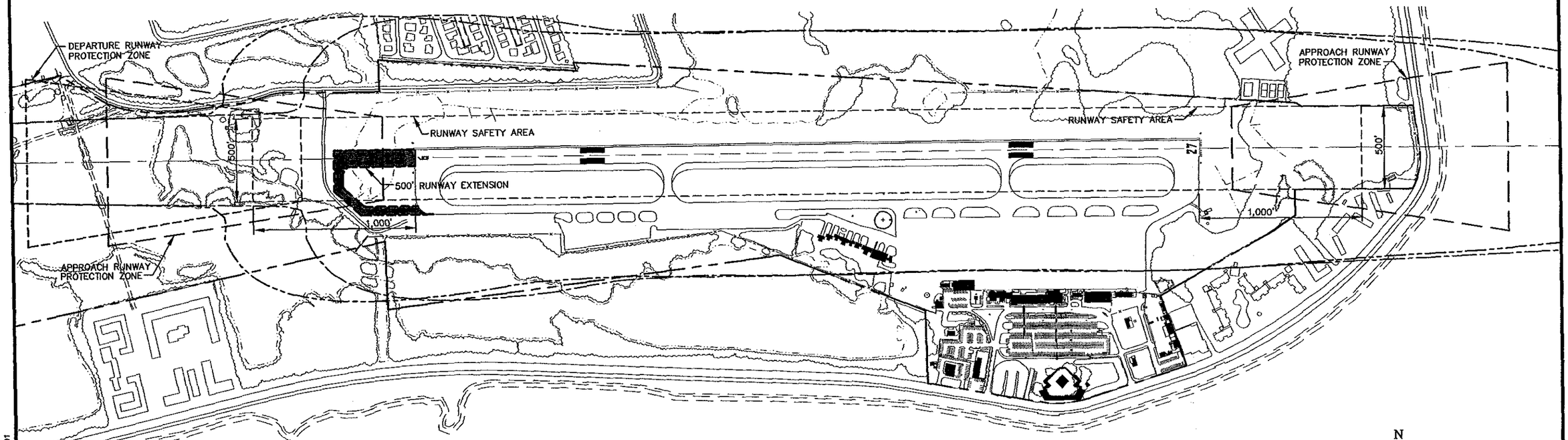
Alternative 5B is depicted in Figure 4.11. This alternative proposes an extension of 750 feet on the west end of the runway and an extension of 500 feet on the east end of the runway. In this regard, it is the same as Alternative 5A. However, Alternative 5B proposes one important difference that would increase the available runway length for takeoffs to the east. This change consists of shifting, or extending, the runway safety area beyond the east end of the runway an additional 250 feet. By extending the runway safety area on the east-end, an additional 250 feet of the proposed extension on

LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRPORT BUILDINGS
- RUNWAY SAFETY AREA
- APPROACH RUNWAY PROTECTION ZONE
- DEPARTURE RUNWAY PROTECTION ZONE
- YEAR 2000 65 DNL NOISE CONTOUR
- ALTERNATIVE 65 DNL NOISE CONTOUR

TAKE OFF DISTANCE
5,301'

LANDING DISTANCE
4,801'



TAKE OFF DISTANCE
4,801'

LANDING DISTANCE
4,801'

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

AIRFIELD ALTERNATIVE 3
500' EXTENSION ON WEST END

Key West International Airport
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FIGURE 4.6

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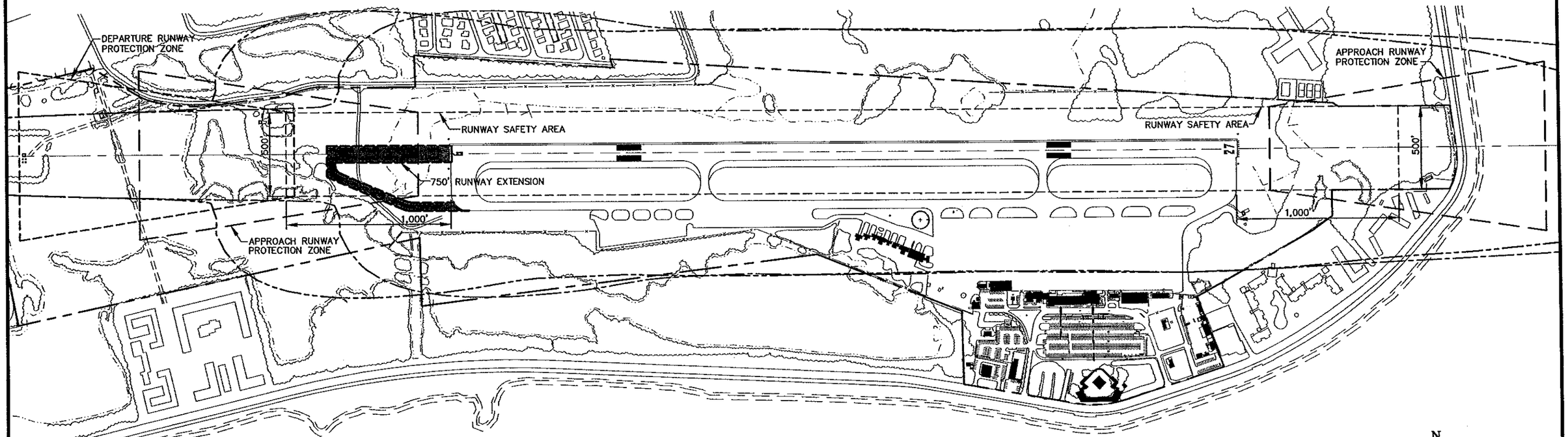
LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRPORT BUILDINGS
- RUNWAY SAFETY AREA
- APPROACH RUNWAY PROTECTION ZONE
- DEPARTURE RUNWAY PROTECTION ZONE
- YEAR 2000 65 DNL NOISE CONTOUR
- ALTERNATIVE 65 DNL NOISE CONTOUR

TAKE OFF DISTANCE
5,551'

LANDING DISTANCE
4,801'



TAKE OFF DISTANCE
4,801'

LANDING DISTANCE
4,801'

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

AIRFIELD ALTERNATIVE 3A
750' EXTENSION ON WEST END

Key West International Airport
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FIGURE 4.7

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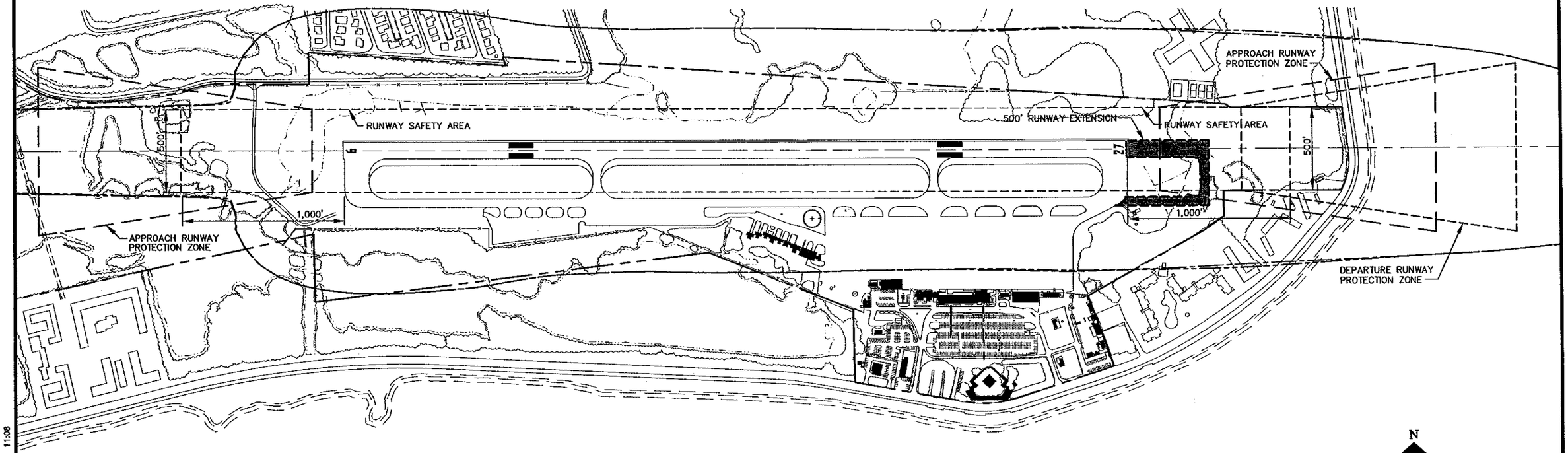
LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRPORT BUILDINGS
- RUNWAY SAFETY AREA
- APPROACH RUNWAY PROTECTION ZONE
- DEPARTURE RUNWAY PROTECTION ZONE
- YEAR 2000 65 DNL NOISE CONTOUR
- ALTERNATIVE 65 DNL NOISE CONTOUR

TAKE OFF DISTANCE
4,801'

LANDING DISTANCE
4,801'



TAKE OFF DISTANCE
5,301'

LANDING DISTANCE
4,801'

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

AIRFIELD ALTERNATIVE 4
500' EXTENSION ON EAST END

Key West International Airport
Master Plan Update

FIGURE 4.8

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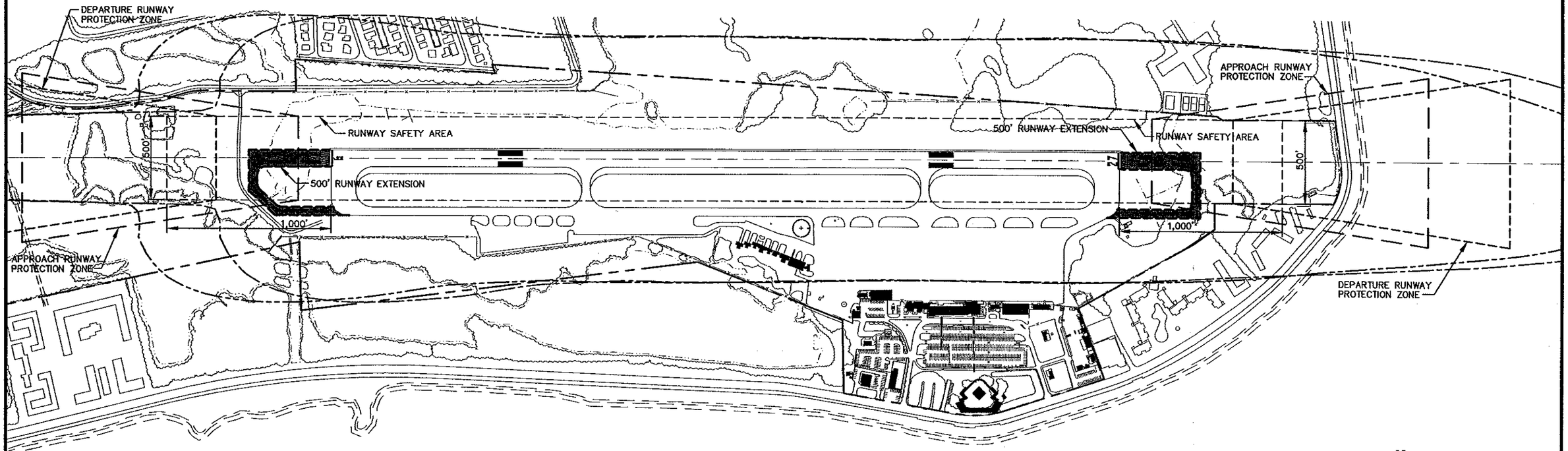
LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRPORT BUILDINGS
- RUNWAY SAFETY AREA
- APPROACH RUNWAY PROTECTION ZONE
- DEPARTURE RUNWAY PROTECTION ZONE
- YEAR 2000 65 DNL NOISE CONTOUR
- ALTERNATIVE 65 DNL NOISE CONTOUR

TAKE OFF DISTANCE
5,301'

LANDING DISTANCE
4,801'



TAKE OFF DISTANCE
5,301'

LANDING DISTANCE
4,801'

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

AIRFIELD ALTERNATIVE 5
500' EXTENSION ON BOTH ENDS

Key West International Airport
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FIGURE 4.9

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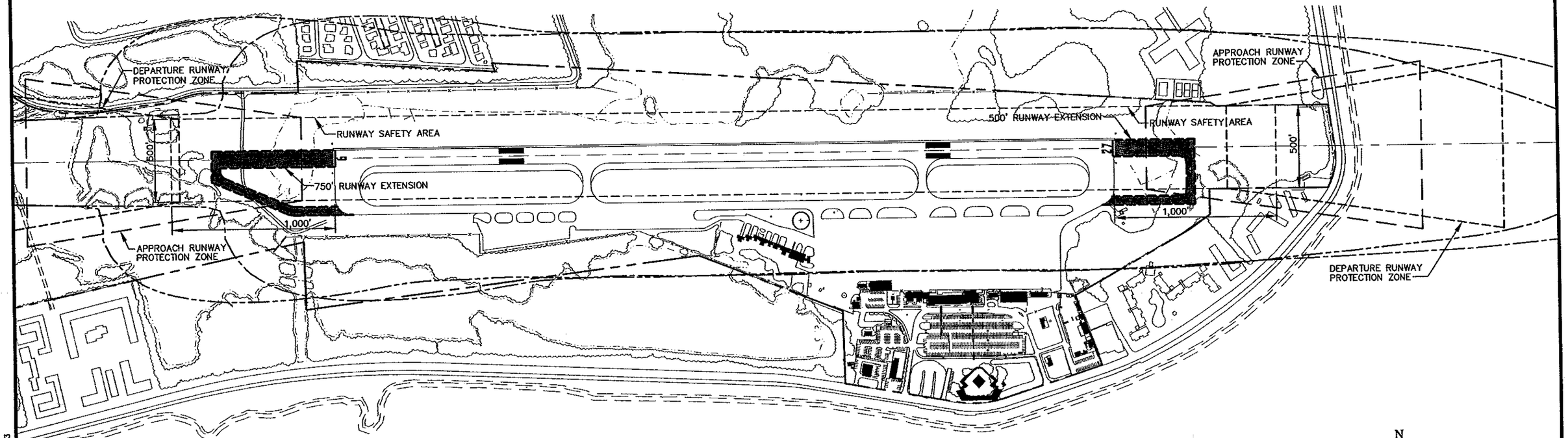
LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRPORT BUILDINGS
- RUNWAY SAFETY AREA
- APPROACH RUNWAY PROTECTION ZONE
- DEPARTURE RUNWAY PROTECTION ZONE
- YEAR 2000 65 DNL NOISE CONTOUR
- ALTERNATIVE 65 DNL NOISE CONTOUR

TAKE OFF DISTANCE
5,551'

LANDING DISTANCE
4,801'



TAKE OFF DISTANCE
5,301'

LANDING DISTANCE
4,801'

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

AIRFIELD ALTERNATIVE 5A
500' EXTENSION ON EAST END
750' EXTENSION ON WEST END

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FIGURE 4.10

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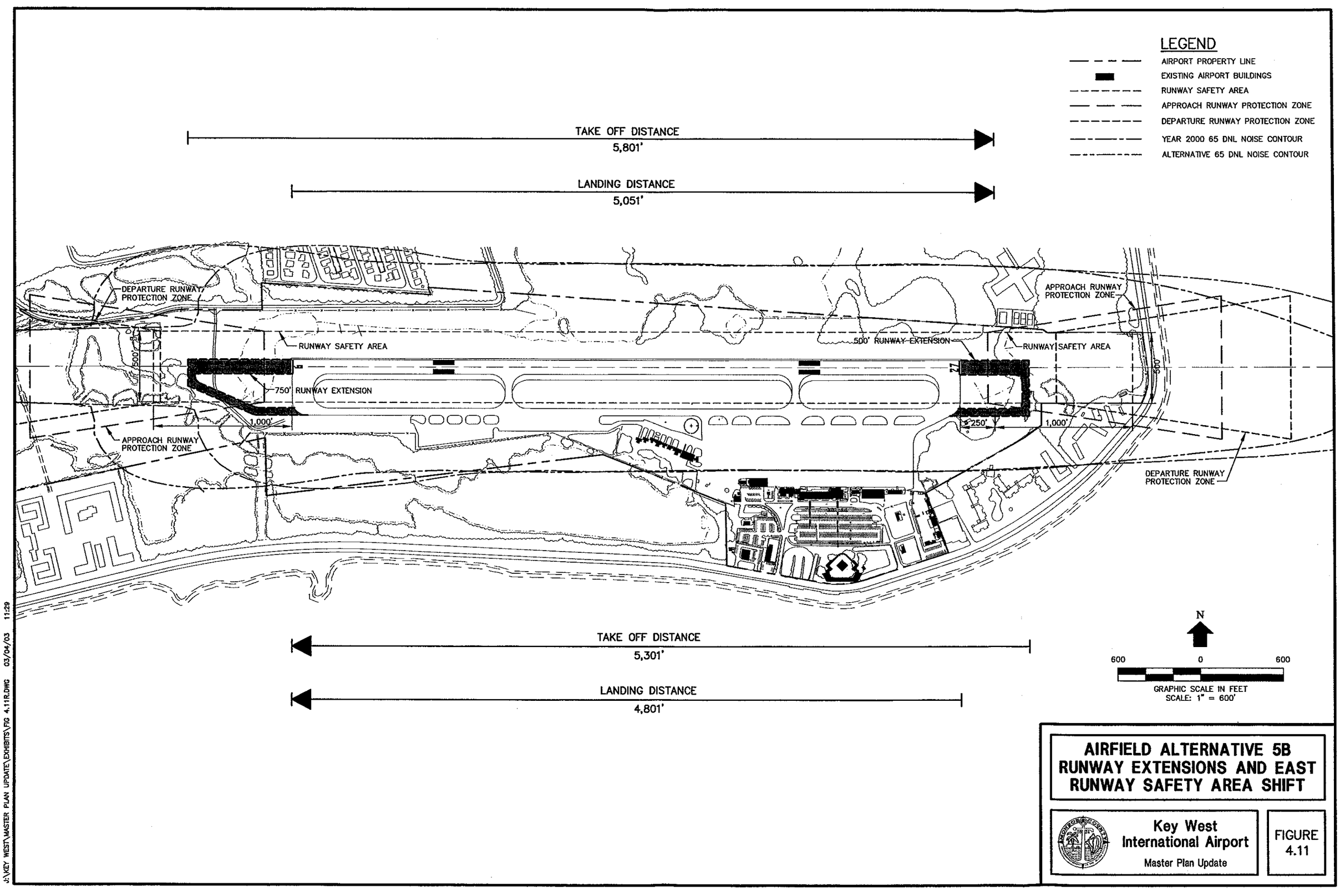

J:\KEY WEST\MASTER PLAN UPDATE\EXHIBITS\FIG 4.11R.DWG 03/04/03 11:29

AIRFIELD ALTERNATIVE 5B
RUNWAY EXTENSIONS AND EAST RUNWAY SAFETY AREA SHIFT

Key West International Airport
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FIGURE 4.11

the east end could be considered in takeoff and landing calculations. This would provide 5,800 feet for takeoffs to the east and 5,051 feet for landings to the east using the declared distances concept.

Limitations of this alternative include the fact the takeoff distance for departures to the west would be restricted to 5,300 feet and landing distances to the west would remain the same as existing 4,801 feet. In addition, the extension of the runway safety area to the east would entail additional impacts to wetlands and mangroves. By extending the runway safety area by 250 feet, the amount of wetlands and mangroves impacted would increase to 37.8 acres an increase of 2.5 acres over Alternative 5A.

With respect to noise impacts, Alternative 5B would shift the 65DNL noise contour to the west as depicted in Figure 4.11. However, no noise sensitive land uses would be encompassed by the noise contour.

The preliminary construction cost for Alternative 5B is $10.4 million.

4.2.5 AIRFIELD ALTERNATIVE 6 – 750' EXTENSION ON WEST END, 1,050' EXTENSION ON EAST END

Alternative 6, depicted in Figure 4.12, proposes an extension of 750 feet on the west end of the runway and an extension of 1,050 feet on the east end of the runway. As shown in the figure, the proposed extension on the east end of the runway would not have a parallel taxiway. That is because such a taxiway could not be constructed without the acquisition of adjoining land that is currently occupied by a hotel. Therefore, a turnaround is provided at the east end of the runway that would allow aircraft to taxi on the runway to the east end and then turnaround for departures to the west.

The primary advantage of Alternative 6 is it is the only alternative that would provide the recommended length of 5,800 feet for takeoffs in both directions. Landing distances would be 5,051 to the east and 4,801 to the west. The primary disadvantage of this alternative is the lack of a parallel taxiway on the east end of the runway. This would necessitate that aircraft taxi on an active runway which is undesirable and becomes even more significant when considering the fact that air traffic control services are not available 24-hours a day.

Alternative 6 would impact 36.2 acres of wetlands, the second most of any of the alternatives evaluated. Noise impacts associated with Alternative 6, in terms of the 65 DNL noise contour, would be similar to Alternatives 5A and 5B. However, on a single event basis Alternative 6 would have greater impacts due to the proximity of the extended east-end of the runway to adjacent hotels.

The preliminary construction cost of Alternative 6 is $10.8 million.

4.2.6 PREFERRED AIRFIELD ALTERNATIVE

An evaluation matrix was prepared to assist in the selection of a preferred airfield alternative. The matrix compares the operational, environmental and financial factors associated with each airfield alternative. The matrix is presented in Table 4.2.

TABLE 4.2
AIRFIELD ALTERNATIVES EVALUATION MATRIX
Key West International Airport
Master Plan Update

	Operational Factors			Environmental Factors	Financial Factors
Runway Alternative	Longest Runway Length	70-seat Regional Jet (Estimated Seats Blocked)	50-seat Regional Jet (Estimated Seats Blocked)	Wetlands Impacted (acres)	Estimated Construction Cost** (dollars)
1	4,801	25	21	0	$0.0
2	4,801	25	21	31	$7.7
3	5,301	8	10	33.2	$9.1
3A	5,551	1	6	33.8	$9.3
4	4,801	25	21	32.5	$9.1
5	5,301	8	10	34.7	$10.0
5A	5,551	1	6	35.3	$10.1
5B*	5,801	0	1	37.8	$10.4
6	5,801	0	1	36.2	$10.8

Source: URS, 2002.

Notes: * A proposed shift of the Runway 27 runway safety area by 250 feet would increase takeoff length on Runway 9 to 5,801 feet.
** Construction cost estimates do not include environmental mitigation.
1) Landing lengths will remain the same as existing (4,801 feet) under all alternatives.
2) The number of seats blocked is based upon a temperature of 89 degrees Fahrenheit.

A few conclusions can be reached when reviewing the matrix. First, with respect to operational factors, alternatives that increase runway length by as little as 500 feet provide significant reduction in payload penalties. Alternative 3, which provides an extension of 500 feet on the west end of the runway, would reduce payloads penalties by 68 percent for the CRJ-700 (70 seat) regional jet and by 52 percent for the CRJ-200 (50-seat) regional jet. Runway extensions that provide additional runway length further reduce payload penalties, but 5,800 feet is required to essentially eliminate payload penalties for the types of regional jet operations evaluated.

With respect to the issue of environmental factors, the evaluation matrix reveals that impacts to salt ponds and wetlands are primarily driven by the construction of a standard runway safety area, not the runway extensions. This can be observed by comparing Alternatives 2 and 3. Alternative 2 would

LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRPORT BUILDINGS
- RUNWAY SAFETY AREA
- APPROACH RUNWAY PROTECTION ZONE
- DEPARTURE RUNWAY PROTECTION ZONE
- YEAR 2000 65 DNL NOISE CONTOUR
- ALTERNATIVE 65 DNL NOISE CONTOUR

TAKE OFF DISTANCE
5,801'

LANDING DISTANCE
5,051'

DEPARTURE RUNWAY PROTECTION ZONE

RUNWAY SAFETY AREA

600'

750' RUNWAY EXTENSION

1,000'

APPROACH RUNWAY PROTECTION ZONE

1,050' RUNWAY EXTENSION

APPROACH RUNWAY PROTECTION ZONE

RUNWAY SAFETY AREA

500'

250'

1,000'

TAKE OFF DISTANCE
5,851'

LANDING DISTANCE
4,801'

N

600 0 600

GRAPHIC SCALE IN FEET
SCALE: 1" = 600'

AIRFIELD ALTERNATIVE 6
750' EXTENSION ON EAST END
1,050' EXTENSION ON WEST END

Key West International Airport
Master Plan Update

FIGURE 4.12

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